

Public Sector Investment and Poverty Reduction In Nigeria: Evidence From 1981- 2022

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Abstract

Public sector investment in any economy is often shown in the level of government spending, which is revealed in the welfare level of her populace as part of her fiscal obligation. This study examines the effect of government expenditure and poverty reduction in Nigeria using secondary data sourced from the publication of the Central Bank of Nigeria Statistical Bulletin and World Development Indicators from 1981 to 2022. The study employed the Auto-regressive Distributive Lag Model (ARDL) to achieve its objectives. The results of the findings revealed that government spending in building and construction, health have a positive and significant effect on per capita income used as a proxy for welfare of Nigeria's populace. While government investment in education has a negative and insignificant effect on per capita income in Nigeria. Moreover, interest rate and inflation rate as contributory variables have a positive effect on per capita income in Nigeria. The study therefore recommends that government should prioritize investment in infrastructure projects such as roads, bridges, energy facilities, and public transportation systems. This will not only stimulate economic growth but also create employment opportunities and improve connectivity across regions. Also, prioritize targeted investments in quality education through teachers training, curriculum development, and infrastructure to enhance the learning environment and ensure that students acquire the necessary skills for economic productivity.

Keywords: Public Sector Investment, Poverty Reduction, per capita income, Nigeria

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1. Introduction

Poverty is a deeply embedded social problem in Nigeria, posing significant challenges to the country's development. Over the years, the Nigerian government has implemented various strategies and policies aimed at reducing poverty and improving the well-being of its citizens. One key approach is through government spending, which plays a vital role in addressing social disparities and providing essential services to the population (Oyekale and Olubanjo 2019).

The relationship between government expenditures and poverty alleviation in Nigeria is assumed to be complex, with multiple factors influencing the effectiveness of public spending on poverty reduction initiatives. One significant factor is the allocation of funds to various sectors. The World Bank (2021) noted that increasing government spending on critical sectors such as education, healthcare, and infrastructure could aid in poverty alleviation, by improving access to basic services and employment opportunities. However, as noted by Nwosu and Ezeani (2018), inadequate sectoral allocations can exacerbate poverty levels in Nigeria by limiting access to these essential services.

However, misallocation of funds, corruption, and poor fiscal management can also reduce the impact of public expenditure on poverty reduction efforts (Oluwasegun & Ajayi, 2019; Nwosu & Ezeani, 2018). Therefore, ensuring transparency and accountability in government spending practices is opined to be essential to maximize the impact of public expenditure on poverty alleviation initiatives. The stability of government revenue sources is crucial for sustainable poverty reduction efforts. As noted by Adeniyi and Olaniyi (2017), the volatility of global oil prices, which significantly impact Nigeria's revenue from oil exports, poses a significant challenge to the government's ability to consistently fund poverty alleviation programs.

Fortunately, the Nigerian government has taken various steps to address poverty over the past five decades. The horrible performance of past social protection interventions was a source of concern to the government of Nigeria and of course Nigerians in general. Despite the availability of abundance resources and statistical records of increasing Gross Domestic Products, the economic well-being of poor citizens remains very low. It is worth noting that excessive government programs implemented in the past, failed to achieve their desired results, hence, leaving the majority of Nigerians under the poverty line (Ibrahim, Mahmood, and Abdulahhi, 2017).

Moreover, researches have proven that government spending could play crucial role in poverty reduction initiatives in developing countries such as Nigeria. However, these does not happen without challenges which could hinder the effectiveness of such spending in alleviating poverty. Consequently, misallocation of funds within the government system is said to be one major challenge faced in Nigeria in this regard (Ajayi 2019). This misallocation is often linked to corruption and lack of transparency in government spending practices (Oluwasegun & Ajayi, 2019).

Observably, budgetary allocation to key sectors such as education, healthcare, and infrastructure in Nigeria has been low, these could be linked to non-achievement of poverty reduction goal. As opined by Nwosu and Ezeani (2018), insufficient investment in critical sectors results in a lack of basic services and opportunities for the poor, perpetuating the cycle of poverty.

Thus, this study seeks to examine the nexus between government investment, which is shown in the level of government spending and poverty reduction in Nigeria. It specifically seeks to;

- i. Examine the long run effect of government spending on building and construction and poverty reduction in Nigeria
- ii. Determine the long run effect of government spending on education and poverty reduction in Nigeria
- iii. Investigate the long run relationship between government spending in health and poverty reduction in Nigeria.

By examining the relationship between government spending and poverty reduction in Nigeria, this research aims to contribute to the existing literature and provide evidence-based insights for policymakers, development practitioners, and stakeholders. It will shed light on the effectiveness of government spending strategies and provide recommendations to enhance their impact in reducing poverty and improving the well-being of the Nigerian population.

2. Literature Review

2.1. Conceptual Issues

According to Alhassan and Odusina (2018) government expenditure plays a vital role in economic growth and poverty reduction throughout the world. According to the Keynesian approach, public spending may increase the aggregate demand which further stimulates economic growth and employment. The size of the government expenditures and their effect has been an issue of continued interest for decades the received literature, essentially of an empirical nature, has proceeded at two levels.

Generally, government expenditure refers to all government expenses, federal, state and/or local, on consumption, investment and transfers. Government social spending, on the contrary, refers to those spending made for the provision of social services to redistribute resources across households. It includes expenses on education and health services, capital transfers and social transfers (Igor, 2016). Spending on education, health, social and community services, play a vital role on a path to sustainable economic growth. Education and health are crucial in human and economic development as these vital sectors could support the production and as well motivate the highly needed manpower which could aid the country's economic growth and development (Nwodo and Ukaegbu 2017). The direction of an economy can be achieved through government spending on social and community services. Okoro (2013) sees social spending as those expenditures made by the government to provide social goods and services. In the same vein, Udoffia and Godson (2016) describe it as the spending made by the government towards the provision of public goods and services.

The meaning of poverty is widely contested in literature, but in the broadest sense, it is seen as the unavailability, or inability of people to attain a socially acceptable standard of living, or not having sufficient resources to acquire basic desires. Extreme or absolute are terms used in describing poverty in literature. This arises when people are faced with conditions of serious lack of basic human needs: food, safe drinking water, sanitation facilities, health, shelter, education and access to information (United Nations 1995). Poverty may also be measured using a set of poverty indicators, which

would comprise a direct definition of poverty (and in some instances, the set of poverty indicators is then combined to create an index).

2.2. Theoretical Framework

Theories of Government Expenditure

Wagner Theory

This study is underpinned by the Wagner theory of expenditure. The earliest known work on the long-run tendency of public expenditure is accredited to Adolph Wagner (1835 – 1917). This theory postulates that different levels of government are faced with increasing fiscal responsibilities and this makes it imperative for them to increase their spending over time, both intensively and extensively. Such spending by the government is a result of the expanding nature of the traditional functions of the state; growth in scope of performing certain functions like defense, justice, law and order, maintenance of state increasing welfare activities; increasing need to provide and expand the spheres of public goods and those necessitating increase in public investments and enterprises, and; provision of social and community services. The above views imply that there exists a functional relationship between poverty reduction (through economic growth) and the growth of government spending on social services.

Keynesians Theory

The Keynesian theory, developed by John Maynard Keynes in 1936, posits that government expenditures play a crucial role in stabilizing the economy and promoting economic growth. According to Keynes, during periods of economic downturn or recession, aggregate demand is insufficient, leading to unemployment and poverty. To address this, the government can increase its expenditures to boost aggregate demand, stimulate economic activity, and reduce poverty. To the study, the theory posits that an increase in government spending on various sectors like infrastructure, education, healthcare, and social welfare programs creates a multiplier effect, where the initial injection of funds leads to additional rounds of spending, generating more economic activity, increasing aggregate demand, as more money is injected into the economy, stimulating production and employment, aggregate demand increases, businesses respond by hiring more workers, reducing unemployment and poverty.

Neoclassical Theory

The neoclassical theory of poverty emerged as an influential economic theory in the mid-20th century. This theory emphasizes individual agency and choices as the primary factors determining poverty. It argues that poverty is a result of individual deficiencies, such as lack of skills or education, and that government intervention in the market can hinder economic growth and perpetuate poverty. Prominent economists associated with the development of neoclassical economics include Milton Friedman, Gary Becker, and Friedrich Hayek.

This theory suggests that poverty is caused by individual choices and behaviors. According to this theory, people are poor because they lack the skills, education, and motivation to succeed in the market economy. It also argues that government intervention in the market, such as minimum wage laws and welfare programs, can make poverty worse by distorting market incentives.

Structural Theory

The structural theory was developed by Karl Marx in 1867. This theory focuses on the broader social and economic structures that create and perpetuate poverty. It suggests that poverty is not just the result of individual choices, but also the result of larger societal factors such as discrimination, lack of access to education and healthcare, and a concentration of wealth and power in the hands of a few. It argues that government intervention is necessary to address these structural problems and provide a safety net for those who are struggling.

Institutional Theory

The institutional theory of poverty began to gain prominence in the mid-20th century, particularly in the fields of sociology and economics. Scholars such as Gunnar Myrdal, William Julius Wilson, and Amartya Sen have contributed to the development and advancement of this theory. This theory suggests that poverty is caused by the failures of institutions, such as government agencies and private corporations, to provide adequate support and opportunities for the poor. It argues that these institutions often prioritize the interests of the wealthy and powerful over those of the poor, leading to a lack of access to education, healthcare, and other essential resources. This theory also emphasizes the need for government intervention in addressing these institutional failures and promote greater equality.

2.3. Empirical Review

Ubong and Ubi-Abai's (2018) conducted a study to examine the effect of government expenditure on poverty, using the Auto-regressive Distributive Lag (ARDL) the study revealed that there exist a negative relationship between recurrent government spending on social and community services and poverty rate. However, government expenditure positively affected poverty rates. The study also found a positive relationship between government capital expenditure on administration and poverty. The findings suggested a bidirectional causality between poverty incidence and recurrent expenditures on social and community services, economic services, and transfers, while a negative relationship exists

between capital expenditure and poverty.

Subsequently, a similar study on Nigeria's government expenditure and poverty reduction was also carried out by [Oriawote and Ukawe in 2018](#), using Error correction Model (ECM) and the cointegration models of the OLS as well as the Granger causality technique to analyze data for the study, the findings revealed that expenditure on health has a significant positive impact on per capita income but with low elasticity. Expenditure on Education was also found to have a positive impact on per capita income, while that of building and construction expenditure had a positive impact but low elasticity on per capita income. The study highlights the need for more effective government spending on poverty reduction.

Similarly, [Omodero \(2019\)](#) and [Yahaya \(2019\)](#) conducted studies on the impact of government sectorial expenditure on poverty reduction in Nigeria. The findings of the study conducted by Omodero revealed that government expenditure on agriculture, building, construction, education, and health is insufficient for poverty reduction. Yahaya's study, using OLS multiple regression techniques, found a significant negative relationship between poverty trends and education, health, and agriculture expenditures in Nigeria from 1965 to 2014.

However, [Adegboyo \(2020\)](#) and [Ibrahim and Umar \(2021\)](#) conducted studies on the impact of government spending on poverty reduction in Nigeria between 1981 and 2017. [Adegboyo's](#) study found that recurrent spending on economic services, social, community, and transfers leads to poverty reduction, while transfers, capital expenditure, and administration increase poverty levels. Ibrahim and Umar's study used the Vector Autoregressive model technique to show that GDP and private investment positively affect poverty, while inflation negatively impacts it.

[Nenbee, Aleogho, Vite and Otovwe \(2021\)](#) examined the role of government spending to reduce poverty in Nigeria between 1980 and 2017 using the Error Correction Model technique for data analysis. The result indicates that government capital expenditure is positively related to per capita income after a one-year lag period. Government recurrent expenditure has a negative and significant impact on per capita income after a one-year lag period. The primary school enrolment rate has a positive and insignificant impact on poverty after a three-year lag period. [Nursini, Fachry and Nurbayani \(2022\)](#) analyzed the influence of government expenditure on productive sectors on the reduction of poverty both directly and indirectly through economic growth in 24 cities in Indonesia for the period 2015-2020, using panel data analysis. Results show that government spendings on education and health, directly and indirectly, affect all poverty indicators. During the Covid-19 pandemic, government spending on health and education was very effective in reducing poverty.

[Fashanu, Kasali and Olowe \(2022\)](#) examined the relative effectiveness of different components of government social expenditure in reducing income poverty in Nigeria using the Autoregressive Distributed Lag (ARDL) model technique for the period from 1981 to 2020. The result shows that while capital transfer and social transfer have the potential for poverty reduction in Nigeria, increased government on-government social expenditure increases the level of poverty.

From the various studies reviewed, it has been observed that most of them focused more on, government capital and recurrent expenditure on poverty alleviation in Nigeria, but majority did not address several key factors, such as infrastructural development, corruption perception index, and interest rate as factors that could aid in poverty alleviation. However, this study intends to fill this gap through an enquiry towards the interplay between these factors and poverty reduction in Nigeria. Which will serve as an addition to the existing literature in this field.

3. Methodology

3.1. Research Design

The econometric method and an ex-post facto research design were used in this investigation. An investigation into the effects of pre-existing regressors on the regressant is known as a quasi-experimental study using an ex-post facto research design. This research design is known as ex post facto because the generated data were already implemented and were not subjected to the researcher's manipulation. It is also an econometric research design since multiple regression analysis, a technique used in econometric research, will be used to analyze the data that has been gathered.

3.2. Source of Data

The data used for the analysis of this study were obtained from secondary sources. The annual series data which covers the period (1981-2022) were principally obtained from the Central Bank of Nigeria Statistical Bulletin and World Development Indicator of various years.

3.3. Model Specification

In the realization of the objective of this study, an estimation of a modified linear regression model was adopted in the model. The notional functional form of the model is expressed below;

$$PCI = f(GBC, GEED, GEH, INF, INT) \dots\dots\dots (1)$$

Re-writing equation (2) in a linear form, we have the equation as:

$$PCI = b_0 + b_1GBC + b_2GEED + b_3GEH - b_4INF + b_5INT \dots\dots\dots (2)$$

To capture the stochastic form (error term) of the model in equation (3), the model is therefore put into econometric form. Thus, expressed as below;

$$PCI = b_0 + b_1GBC + b_2GEED + b_3GEH - b_4INF + b_5INT + U_t \dots\dots\dots (3)$$

Where

PCI = Per Capita Income used as proxy for welfare of the people

GBC = Government Spending in Building and Constructions

INT = Interest rate

GEED = Government Spending in Education

GEH = Government Spending in Health

INF = Inflation Rate

U_t = Error term or disturbance term

3.4. Method of Analysis

The study adopted the Autoregressive Distributive Lag Model (ADRL) technique to estimate the effect of the predictor variables on the explained variable in the short run and also in the long run. The econometric package used in this analysis is the Econometric Views (E-views). The result of the model will be evaluated based on three criteria Econometric A'priori expectation, statistical test of significance and econometric test.

4. Data Analysis and Discussion of Findings

4.1. Descriptive Analysis of the Data

Table 1, provides the result of the descriptive analysis conducted on the time series data for Nigeria adopted for the study. The table shows that the total number of observations for all variables is 42. The variables captured include per capita income (PCI) which is used as a proxy for welfare of the people, government spending in building and constructions (GBC), interest rate proxy as lending rate of interest (INT), government spending in education (GEED), inflation (INF) and government spending in Health (GEH).

Table 1: Descriptive Statistics

	PCI	GEED	GBC	GEH	INF	INT
Mean	10.75725	3.127535	2.038052	2.359145	18.73595	17.23140
Median	11.02286	4.115363	2.354932	3.352089	12.72000	16.92153
Maximum	13.62325	6.555327	7.222319	6.081125	72.84000	31.65000
Minimum	6.535370	-1.819208	-2.356494	-3.186541	5.390000	8.431667
Std. Dev.	2.202891	2.856913	2.723149	3.044762	16.51344	4.951077
Skewness	-0.316900	-0.555727	-0.145149	-0.424541	1.892362	0.268364
Kurtosis	1.674568	1.898462	1.744121	1.724671	5.460600	3.478426
Jarque-Bera	3.777326	4.285253	2.907632	4.107958	35.66269	0.904697
Probability	0.151274	0.117346	0.233677	0.128224	0.000000	0.636133
Sum	451.8043	131.3565	85.59817	99.08407	786.9100	723.7187
Sum Sq. Dev.	198.9618	334.6400	304.0372	380.0936	11180.45	1005.040
Observations	42	42	42	42	42	42

Source: Researcher’s computation using Eviews 12

In line with Table 4.1, per capita income has a mean of 10.75% and standard deviation of 2.20%. Per capita income was normally distributed as the probability of its jarque-bera value (0.1512) is greater than 0.05% critical value. Government spending in building and constructions, education and health had a mean of 2.03%, 3.12% and 2.35% and have standard deviation of 2.72%, 2.85% and 3.04%. Government spending in buildings and construction, education and health were normally distributed. This is because their probability of Jarque-Bera statistics was greater than 0.05% critical value. Inflation rate had a mean value of 18.73% and a standard deviation of 16.51%. Inflation rate was not normally distributed because the probability associated with the Jarque-Bera statistics is lesser than 0.05% critical value. The interest rate had a mean value of 17.23% and a deviation from mean of 4.95%. Hence, the interest rate was normally distributed.

4.2. Correlation Matrix

Correlation or dependency in statistics refers to any statistical link, whether causal or not, between two random variables or bivariate data. Correlation, in the broad sense, refers to any statistical link, although it refers to the degree to which two variables are linearly associated. The Pearson correlation coefficient can reveal the linear link between two variables. The coefficient ranges between -1 and 1. The value, -1, suggests a perfect negative connection, 1 is the opposite of -1, and 0 indicates no link. Thus, the further away the correlation coefficient is from zero, the stronger the relationship between the two variables.

Table 2: Correlation Matrix

	PCI	GEED	GBC	GEH	INF	INT
PCI	1.000000	0.978223	0.973998	0.984822	-0.268464	0.210616
INGEED	0.978223	1.000000	0.959753	0.994098	-0.183403	0.300740
INGBC	0.973998	0.959753	1.000000	0.967791	-0.325461	0.159171
INGEH	0.984822	0.994098	0.967791	1.000000	-0.238739	0.261602
INF	-0.268464	-0.183403	-0.325461	-0.238739	1.000000	0.381584
EODB	0.210616	0.300740	0.159171	0.261602	0.381584	1.000000

Source: Researcher's computation using EViews 12

Table 2 shows the linear relationship between the independent and dependent variables employed in the study. Table 2 indicates that government spending in building and construction, education, health and interest rate have a positive correlation with per capita income proxy as welfare of the people. Thus, it implies that an increase/decrease in government spending in building and construction, education, health and interest rate will increase/decrease per capita income in Nigeria. Inflation rate shows a negative correlation with per capita in Nigeria implying an inverse correlation between inflation and per capita income in Nigeria. Thus, the explanatory variables exhibit no form of multicollinearity among them as none of them has a correlation coefficient that is 1 or above.

The Unit Root Test

The Unit root test adopted for the study is the Augmented Dickey-Fuller test using the Akaike Info Criterion (AIC) using a period lag. The result is presented in the table below.

Table 3: Augmented Dickey-Fuller Unit Root Test

Variables	ADF t-statistic	5% Critical Value	Integration Order
PCI	-8.2910	-2.9369	I(1)
GBC	-3.9761	-3.5236	I(0)
GEED	-5.7443	-2.9411	I(1)
GEH	-6.6391	-2.9389	I(1)
INT	-2.6184	-1.9498	I(1)
INF	-3.5678	-2.9369	I(0)

Source: Researcher's computation using EViews 12

The Unit root test ascertains at what level the variables adopted for the study become stationary and thus fit for the analysis, the Augmented Dickey-Fuller unit root test was conducted and the result is presented in Table 3 After computing the unit root test, the variables were found to be stationary at mix order of integration that is, at levels I(0) and at first differencing I(1).

Lag Length Selection Criteria

Table 4 shows the outcome of the lag order selection criteria for the model because too many lags in the model will lead to a loss of degree of freedom, the coefficient may be statistically insignificant and multicollinearity can exist among the explanatory variables while too few lags can lead to specification error. To determine the optimum lag length to be employed in the study, the Akaike Information Criterion was chosen and the result is presented in table 4 below

Table 4: Optimal Lag Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-415.1102	NA	96.37039	21.59539	21.85133	21.68722
1	-228.3057	306.5509	0.043203	13.86183	15.65336	14.50462
2	-166.7219	82.11178	0.013319	12.54984	15.87696	13.74358
3	-95.88579	72.65240*	0.003274*	10.76337*	15.62609*	12.50808*

* Indicates lag order selected by the criterion. LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan Quinn information criterion

Table 4 above uses the Akaike Information Criterion for the study, the Akaike Information Criterion indicates an optimum lag length of two (2). Thus, the optimum lag length to be employed in the autoregressive distributive lag is two. ARDL-Bound Test Approach to Co-integration

The test of stationarity paves the way for the examination of the long-run relationship between the exchange rate and domestic investment in Nigeria. The long-run relationship among the variables is determined by the ARDL bound test as presented in the table below

Table 5 ARDL Bounds Test Result for Levels Relationship

Test Statistic	Value	k	Critical Value Bounds		
			Significance	I0 Bound	I1 Bound
F-statistic	45.8445	5	0.05	2.39	3.38

From the table above, the results show that the F-statistics value of 45.8445 is greater than the lower bound and lower than the upper bound respectively at a 5% level of significance (2.39) and 3.38). Thus, we reject the null hypothesis of no co-integration and conclude that a long-run relationship exists between the dependent and the independent variables

Error Correction Model Estimates

The ARDL model was employed because the unit root from both Augmented Dicky Fuller tests showed that our variables use in the study were stationary at I(0) and I(1). Furthermore, the ARDL bound test for co-integration was employed to check the existence of a long-run relationship among the variables employed for the study.

Table 6: Short Run ARDL and Error Correction Model Estimates

Variable	Coefficient	Standard Error	t-statistic	Probability
PCI(-1)	0.8308	0.0433	19.1761	0.0000
GBC	0.0415	0.0168	2.4623	0.0207
GBC(-1)	-0.0463	0.0214	-2.1609	0.0402
GBC(-2)	0.0609	0.0216	2.8228	0.0090
GEED	-0.0252	0.0366	-0.6883	0.4973
GEED(-1)	0.0384	0.0219	1.7520	0.0916
GEED(-2)	-0.0386	0.0206	-1.8680	0.0731
GEH	0.0836	0.0362	2.3106	0.0290
INT	-0.0013	0.0037	-0.3648	0.7181
INT(-1)	-0.0091	0.0043	-2.1287	0.0429
INT(-2)	0.0234	0.0042	5.5753	0.0000
INF	-0.0009	0.0009	0.9467	0.3535
INF(-1)	0.0009	0.0008	1.1823	0.2478
CointEq(-1)	-0.1692	0.0085	-19.8738	0.0000
C	1.4664	0.4055	3.6162	0.0013
R-squared	0.9996	Mean dependent var		10.9436
Adjusted R-squared	0.9994	S.D. dependent var		2.0835
Log likelihood	72.1745	Durbin-Watson stat		1.8096
F-statistic	5335.62			
Prob(F-statistic)	0.0000			

Source: Researcher’s Computation Using EVIEWS 12

The error correction model in table 6 shows most of the variables employed in the model are statistically significant at 5% level of significance. In the context of the variables of interest, the short-run result reveals that the first period lag of per capita income PCI (-1) has a positive and significant effect on its current value. This means that the one-period lag value of per capita income increases the present level of misery index by 0.8308% in the short run.

Government spending in building and construction is statistically significant and positive at a 5% level of significance. This implies that the present value of government spending in building and construction increases per capita income by 0.0415%. Whereas, a period lag of government spending in building and constructions has a negative and significant effect on per capita income at 0.0463% in the short run. Also its second period lag has a positive and significant effect on per capita income in Nigeria in the short run.

Moreover, the current period of government spending in education has a coefficient of -0.0252% implying government spending in education has a negative and insignificant effect on per capita income in Nigeria within the short run. Whereas, a period lag of government spending in education has a positive and insignificant effect on per capita income, implying that an increase in the past value of government spending in education contributed positively to per capita income at a rate of 0.0384% in the short run. However, the second period lag of government spending in education has a negative effect on per capita income in Nigeria.

Furthermore, government spending in health has a positive and significant effect on per capita income. This implies that a percent increase in government spending in health will raise the per capita income to a rate of 0.0836% in Nigeria within the short run. Interest rate coefficient value was found to be -0.0013%, which implies that there is an inverse and insignificant relationship between interest rate and per capita income in Nigeria in the short run. It implies that a percent increase in interest rate, on average, decreases per capita income by 0.0013% in the short run. This conforms to a prior expectation. This is because an increase in interest rate will decrease economic activities in Nigeria which bring a fall in per capita income leading to an increase in poverty in Nigeria. A period lag of interest rate has a negative and insignificant effect with per capita income in Nigeria, while the second period lag has a positive and significant effect on per capita income in Nigeria within the period under review.

Inflation rate coefficient value was found to be -0.0009%, which implies that there is an inverse and insignificant relationship between the inflation rate and per capita income in Nigeria. It implies that a percent increase in inflation, on average, decreases per capita income by 0.0009% in the short run. Also, a period lag of the inflation rate has a positive effect on per capita income in Nigeria within the period under review. The co-integrating equation $CointEq(-1)$ which represents the error correction model signifies that the convergence to long-run equilibrium is negative at 0.1692% implying that the previous year's errors would be corrected in the following years at an adjustment speed of 16.92%.

ARDL Long Run Result

In econometrics, the autoregressive distributed lag (ARDL) model is a regression model that includes lags of the dependent variable as regressors, along with lags of the independent variables. This model is used to analyze the long-run relationship between variables while accounting for both short-run dynamics and potential endogeneity.

Table 7: ARDL Long run Estimated Coefficients

Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GBC	0.331816	0.138387	2.397746	0.0240
GEED	-0.149679	0.228771	-0.654276	0.5187
GEH	0.494475	0.204414	2.418994	0.0229
INT	0.076459	0.029600	2.583060	0.0158
INF	0.011212	0.006291	1.782207	0.0864
C	8.667094	0.300249	28.86632	0.0000

$$EC = PCI - (0.3318 * GBC - 0.1497 * GEED + 0.4945 * GEH + 0.0765 * INT + 0.0112 * INF + 8.6671)$$

The long-run ARDL result shows the effect of government spending in building and construction, government spending in education, government spending in health, interest rate and inflation rate on per capita income in Nigeria. In the context of the variables of interest, government spending in building and construction coefficient values has a positive and significant relationship with per capita income in Nigeria. This implies that an increase in government spending in building and construction will increase per capita income by 0.3318% in the long run. Moreover, in the long run, government spending in education has a negative and statistically insignificant relationship with per capita income in

Nigeria. This implies that an increase/decrease in government spending in education will decrease/increase per capita income by 5.26% in Nigeria during the period under study.

However, in the long run, government spending in health estimated coefficient value was found to be 0.4944%, which implies that there is a positive and significant relationship between the government spending in health and per capita income in Nigeria. The result shows that the government spending in health is statistically significant in explaining changes in per capita income in Nigeria in the long run. It implies that a percent increase in the government spending in health, on average, increases per capita income by 0.4944% in the long run.

Also, in the long run, interest rate estimated value was found to be 0.0764%, which implies that there is a positive and significant relationship between interest rate and per capita income in Nigeria. The result shows that the rate of interest is statistically significant in explaining changes in per capita income in Nigeria in the long run. It implies that a percent increase in interest rate, on average, increases per capita income by 0.0764% in the long run. Lastly, inflation rate estimated is 0.0112%. This implies that there is a positive and insignificant effect of inflation rate with per capita income in Nigeria. A percent increase or decrease in inflation rate will lead to a 0.0112% increase or decrease in per capita income in Nigeria in the long run.

4.3. Diagnostics Test

These tests are based on econometric theory and are aimed at finding out whether the econometric assumptions are satisfied. The analysis that will be carried out includes normality, heteroscedasticity test, autocorrelation test, and causality test.

Normality Test

The Jarque-Bera Statistics is used to test for normality in the model. The Jarque-Bera Statistics show if the residual violates the normality assumption. The null hypothesis (H0: the presence of normality) and the alternative hypothesis (the absence of normality).

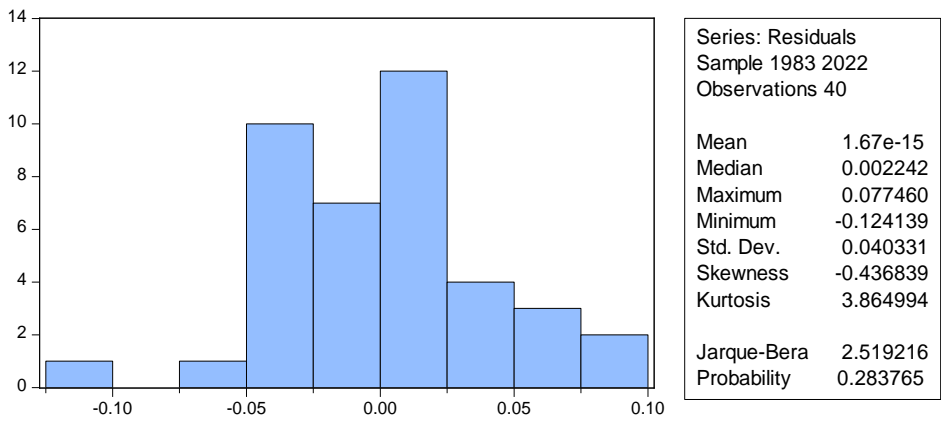


Figure 1: Residual Normality chart

Source: E-view Output 12

The decision rule is to reject the null hypothesis if the histogram is bell-shaped and the Jarque-Bera probability is greater than 0.05% level significance. Figure 1, above shows that the residual is normally distributed as the probability value for the Jarque-Bera is greater than 0.05% critical value

Serial Correlation Test

The Breusch-Godfrey LM Test is used in this study to check for Serial Correlation. The null (H0: the absence of serial correlation) and alternative (H1: the presence of serial correlation) hypotheses. The decision rule is to accept the null hypothesis if the p-value is greater than 0.05% critical value or reject it if the p-value is less than 0.05% critical value.

Table 8: Breusch-Godfrey Serial Correlation LM Test

F-statistic	1.466272	Prob. F(2,24)	0.2507
Obs*R-squared	4.355390	Prob. Chi-Square(2)	0.1133

Source: Author’s Computation

Table 8 shows the results of the test. The probability values of the F and Chi-square are lower than 0.05% level of significance. Thus, the null hypothesis was rejected and concluded that the model is free from serial correlation, implying

that the error term are not correlated.

Heteroskedasticity Test

The Breusch-Pagan-Godfrey test is employed in this study to check for Heteroskedasticity. The null (H0: no constant variance - homoscedastic) and alternative (H1: constant variance - heteroscedastic) hypotheses. The decision rule is to accept the null hypothesis if the p-value is above 0.05% critical value or reject it if the p-value is less than 0.05% critical value.

Table 9: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.889878	Prob. F(13,26)	0.5731
Obs*R-squared	12.31717	Prob. Chi-Square(13)	0.5018
Scaled explained SS	7.454723	Prob. Chi-Square(13)	0.8772

Source: Author's Computation

Table 9 represents the Heteroskedasticity test result and it shows that Probability F is above 0.05% critical value. As a result, we fail to reject the null hypothesis and accept that our model is homoscedastic.

4.4. Policy Implications of Findings

The positive effect of government spending in building and construction, as well as government spending in health, on per capita income in Nigeria carries significant policy implications that can inform decision-making and policy formulation at both the federal and state levels. The findings suggest that increasing government spending in building and construction projects can have a positive impact on per capita income. This implies that policymakers in Nigeria may consider prioritizing investments in infrastructure projects such as roads, bridges, ports, and energy facilities to stimulate economic growth, enhance productivity, and create employment opportunities.

Moreover, the positive relationship between government spending in health and per capita income highlights the importance of investing in healthcare services and facilities. Policymakers may focus on improving access to quality healthcare, investing in medical infrastructure, and promoting public health initiatives to enhance the well-being of the population, increase productivity, and drive economic growth. By increasing government spending in building, construction, education and health sectors, policymakers in Nigeria can address poverty, reduce inequality, and promote inclusive economic growth. Targeted investments in infrastructure, healthcare and education can benefit marginalized communities, improve living standards, and create opportunities for socio-economic advancement.

Given the positive impact of government spending on per capita income, policymakers need to ensure prudent fiscal management, transparency, and accountability in the allocation of resources. Effective monitoring and evaluation mechanisms are essential to track the impact of spending programs, identify inefficiencies, and optimize resource allocation for maximum economic benefit.

5. Conclusion and Recommendations

The study provides compelling evidence of the positive impact of government expenditures on building and construction, education, and health on per capita income in Nigeria. The findings underscore the critical role that strategic investments in key sectors play in driving economic growth, improving living standards, and fostering sustainable development. By demonstrating the link between government spending in building and construction, education, and health, and per capita income, the study highlights the importance of policy decisions that prioritize infrastructure development, human capital investment, and healthcare provision. These findings have significant implications for policymakers in Nigeria, as they point towards the potential for targeted public expenditures to stimulate economic activity, enhance productivity, and reduce poverty. In conclusion, the positive relationship between government spending in building and construction, government spending in health, and per capita income in Nigeria highlights the transformative potential of strategic investments in key sectors. By formulating evidence-based policies, enhancing resource allocation efficiency, and fostering collaboration between public and private stakeholders, policymakers can drive inclusive growth, improve living standards, and advance the socio-economic development agenda in Nigeria.

Recommendations

Based on the findings that government spending in building and construction, as well as health, has a positive effect on per capita income in Nigeria, the following recommendations were given to guide policymakers in maximizing the impact of these investments:

1. It is recommended for the government to prioritize investment in infrastructure projects such as roads, bridges, energy facilities, and public transportation systems. This will not only stimulate economic growth but also create

- employment opportunities and improve connectivity across regions.
2. Policymakers should focus on improving healthcare services by investing in medical infrastructure, healthcare facilities, and health workforce training. Access to quality healthcare can improve the well-being of the population, increase productivity, and contribute to economic growth.
 3. The government should focus on optimizing the efficiency and effectiveness of education spending. This can be achieved by conducting regular audits and assessments to identify areas of wasteful expenditure and redirect resources towards initiatives that have a higher impact on student outcomes and economic development. Rather than solely focusing on increasing overall education spending, they should also prioritize targeted investments in quality education. This includes improving teacher training, curriculum development, and infrastructure to enhance the learning environment and ensure that students acquire the necessary skills for economic productivity.

Conflict of Interest

The authors declare that they have no conflicting interests.

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Data availability statement

The data used to support the findings of this study are available from the corresponding author upon request.

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APPENDICES

Descriptive Statistics

	PCI	GBC	GEED	GEH	INT	INF
Mean	10.75725	2.038052	3.127535	2.359145	17.23140	18.73595
Median	11.02286	2.354932	4.115363	3.352089	16.92153	12.72000
Maximum	13.62325	7.222319	6.555327	6.081125	31.65000	72.84000
Minimum	6.535370	-2.356494	-1.819208	-3.186541	8.431667	5.390000
Std. Dev.	2.202891	2.723149	2.856913	3.044762	4.951077	16.51344
Skewness	-0.316900	-0.145149	-0.555727	-0.424541	0.268364	1.892362
Kurtosis	1.674568	1.744121	1.898462	1.724671	3.478426	5.460600
Jarque-Bera	3.777326	2.907632	4.285253	4.107958	0.904697	35.66269
Probability	0.151274	0.233677	0.117346	0.128224	0.636133	0.000000
Sum	451.8043	85.59817	131.3565	99.08407	723.7187	786.9100
Sum Sq. Dev.	198.9618	304.0372	334.6400	380.0936	1005.040	11180.45
Observations	42	42	42	42	42	42

Correlation Matrix

	PCI	GBC	GEED	GEH	INT	INF
PCI	1.000000	0.973998	0.978223	0.984822	0.210616	-0.268464
GBC	0.973998	1.000000	0.959753	0.967791	0.159171	-0.325461
GEED	0.978223	0.959753	1.000000	0.994098	0.300740	-0.183403
GEH	0.984822	0.967791	0.994098	1.000000	0.261602	-0.238739
INT	0.210616	0.159171	0.300740	0.261602	1.000000	0.381584
INF	-0.268464	-0.325461	-0.183403	-0.238739	0.381584	1.000000

Unit Root Test Result

Null Hypothesis: the variable has a unit root

		At Level					
		PCI	GBC	GEED	GEH	INT	INF
With Constant	t-Statistic	-1.0242	-0.6721	-3.0507	-2.8508	-2.4980	-2.5186
	Prob.	0.7354	0.8417	0.0397	0.0626	0.1239	0.1189
		n0	n0	**	*	n0	n0
With Constant & Trend	t-Statistic	-0.1197	-3.9762	-0.4747	-1.4972	-2.3189	-3.8106
	Prob.	0.9927	0.0174	0.9803	0.8096	0.4142	0.0262
		n0	**	n0	n0	n0	**
Without Constant & Trend	t-Statistic	4.4219	0.9722	-0.0988	-1.0962	-0.5439	-1.2574
	Prob.	1.0000	0.9095	0.6419	0.2416	0.4748	0.1884
		n0	n0	n0	n0	n0	n0
		At First Difference					
		d(PCI)	d(GBC)	d(INGEED)	d(GEH)	d(INT)	d(INF)
With Constant	t-Statistic	-8.2911	-5.8831	-5.3160	-0.4445	-2.5614	-6.4514
	Prob.	0.0000	0.0000	0.0001	0.8894	0.1098	0.0000
		***	***	***	n0	n0	***
With Constant & Trend	t-Statistic	-8.1433	-5.7912	-5.2734	-5.6953	-2.9232	-6.3869
	Prob.	0.0000	0.0001	0.0007	0.0002	0.1669	0.0000
		***	***	***	***	n0	***
Without Constant & Trend	t-Statistic	-1.6354	-6.4940	-1.5141	-0.7762	-2.6185	-6.5402
	Prob.	0.0955	0.0000	0.1199	0.3720	0.0102	0.0000
		*	***	n0	n0	**	***

Notes:

a: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant

b: Lag Length based on AIC

c: Probability based on MacKinnon (1996) one-sided p-values.

Lag Length Selection Criterion

VAR Lag Order Selection Criteria

Endogenous variables: PCI GBC GEED GEH INT INF

Exogenous variables: C

Date: 05/12/24 Time: 18:48

Sample: 1981 2022

Included observations: 39

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-415.1102	NA	96.37039	21.59539	21.85133	21.68722
1	-228.3057	306.5509	0.043203	13.86183	15.65336	14.50462
2	-166.7219	82.11178	0.013319	12.54984	15.87696	13.74358
3	-95.88579	72.65240*	0.003274*	10.76337*	15.62609*	12.50808*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

ARDL BOUND TEST

F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	45.84456	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
		Asymptotic: n=1000		

Error Correction Model

ARDL Error Correction Regression
 Dependent Variable: D(PCI)
 Selected Model: ARDL(1, 2, 2, 0, 2, 1)
 Case 2: Restricted Constant and No Trend
 Date: 05/12/24 Time: 18:52
 Sample: 1981 2022
 Included observations: 40

ECM Regression
 Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GBC)	0.041546	0.011997	3.462899	0.0019
D(GBC(-1))	-0.060973	0.014045	-4.341227	0.0002
D(GEED)	-0.025206	0.016303	-1.546101	0.1342
D(GEED(-1))	0.038609	0.013353	2.891319	0.0076
D(INT)	-0.001365	0.002901	-0.470632	0.6418
D(INT(-1))	-0.023491	0.002784	-8.438898	0.0000
D(INF)	0.000938	0.000575	1.630419	0.1151
CointEq(-1)*	-0.169200	0.008514	-19.87381	0.0000
R-squared	0.874229	Mean dependent var		0.152465
Adjusted R-squared	0.846717	S.D. dependent var		0.113722
S.E. of regression	0.044524	Akaike info criterion		-3.208727
Sum squared resid	0.063436	Schwarz criterion		-2.870951
Log likelihood	72.17455	Hannan-Quinn criter.		-3.086598
Durbin-Watson stat	1.809674			

* p-value incompatible with t-Bounds distribution.

SHORT RUN ARDL RESULT

Dependent Variable: PCI
 Method: ARDL
 Date: 05/12/24 Time: 18:54
 Sample (adjusted): 1983 2022
 Included observations: 40 after adjustments
 Maximum dependent lags: 2 (Automatic selection)
 Model selection method: Akaike info criterion (AIC)
 Dynamic regressors (2 lags, automatic): GBC GEED GEH INT
 INF
 Fixed regressors: C
 Number of models evaluated: 486
 Selected Model: ARDL(1, 2, 2, 0, 2, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
PCI(-1)	0.830800	0.043325	19.17619	0.0000
GBC	0.041546	0.016873	2.462326	0.0207
GBC(-1)	-0.046375	0.021468	-2.160191	0.0402
GBC(-2)	0.060973	0.021600	2.822853	0.0090
GEED	-0.025206	0.036620	-0.688316	0.4973
GEED(-1)	0.038489	0.021968	1.752033	0.0916
GEED(-2)	-0.038609	0.020668	-1.868045	0.0731
GEH	0.083665	0.036209	2.310627	0.0290
INT	-0.001365	0.003742	-0.364891	0.7181
INT(-1)	-0.009189	0.004317	-2.128706	0.0429
INT(-2)	0.023491	0.004213	5.575398	0.0000
INF	0.000938	0.000990	0.946738	0.3525
INF(-1)	0.000960	0.000812	1.182358	0.2478
C	1.466476	0.405519	3.616294	0.0013

R-squared	0.999625	Mean dependent var	10.94361
Adjusted R-squared	0.999438	S.D. dependent var	2.083504
S.E. of regression	0.049395	Akaike info criterion	-2.908727
Sum squared resid	0.063436	Schwarz criterion	-2.317620
Log likelihood	72.17455	Hannan-Quinn criter.	-2.695001
F-statistic	5335.624	Durbin-Watson stat	1.809674
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

LONG RUN ARDL RESULT

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GBC	0.331816	0.138387	2.397746	0.0240
GEED	-0.149679	0.228771	-0.654276	0.5187
GEH	0.494475	0.204414	2.418994	0.0229
INT	0.076459	0.029600	2.583060	0.0158
INF	0.011212	0.006291	1.782207	0.0864
C	8.667094	0.300249	28.86632	0.0000

EC = PCI - (0.3318*GBC - 0.1497*GEED + 0.4945*GEH + 0.0765
*INT + 0.0112*INF + 8.6671)

Normality Test
SERIAL CORRELATION TEST
Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.466272	Prob. F(2,24)	0.2507
Obs*R-squared	4.355390	Prob. Chi-Square(2)	0.1133

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 05/12/24 Time: 18:57
Sample: 1983 2022
Included observations: 40
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PCI(-1)	-0.004244	0.043574	-0.097386	0.9232
GBC	0.003434	0.016734	0.205194	0.8392
GBC(-1)	0.008034	0.021705	0.370167	0.7145
GBC(-2)	-0.005397	0.021991	-0.245411	0.8082
GEED	-0.009217	0.036385	-0.253321	0.8022
GEED(-1)	-0.001125	0.021800	-0.051591	0.9593
GEED(-2)	0.002242	0.020546	0.109126	0.9140
GEH	0.007032	0.036060	0.195020	0.8470
INT	0.000526	0.003753	0.140013	0.8898
INT(-1)	-0.000349	0.004246	-0.082142	0.9352
INT(-2)	-0.000875	0.004277	-0.204570	0.8396
INF	0.000166	0.001013	0.163542	0.8715
INF(-1)	0.000313	0.000818	0.382573	0.7054
C	0.045175	0.408008	0.110721	0.9128
RESID(-1)	0.082697	0.208116	0.397359	0.6946
RESID(-2)	-0.363087	0.219717	-1.652515	0.1115

R-squared	0.108885	Mean dependent var	1.67E-15
Adjusted R-squared	-0.448062	S.D. dependent var	0.040331

S.E. of regression	0.048532	Akaike info criterion	-2.924009
Sum squared resid	0.056529	Schwarz criterion	-2.248457
Log likelihood	74.48018	Hannan-Quinn criter.	-2.679751
F-statistic	0.195503	Durbin-Watson stat	1.953215
Prob(F-statistic)	0.999016		

Heteroskedasticity Test Result

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.889878	Prob. F(13,26)	0.5731
Obs*R-squared	12.31717	Prob. Chi-Square(13)	0.5018
Scaled explained SS	7.454723	Prob. Chi-Square(13)	0.8772

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 05/12/24 Time: 18:58

Sample: 1983 2022

Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.026356	0.022740	1.159006	0.2570
PCI(-1)	-0.002789	0.002429	-1.147818	0.2615
GBC	0.001821	0.000946	1.924272	0.0653
GBC(-1)	-0.001259	0.001204	-1.046148	0.3051
GBC(-2)	-0.000792	0.001211	-0.653913	0.5189
GEED	0.000323	0.002054	0.157412	0.8761
GEED(-1)	0.001265	0.001232	1.026623	0.3141
GEED(-2)	-0.000740	0.001159	-0.638129	0.5290
GEH	0.001253	0.002030	0.617167	0.5425
INT	-8.75E-05	0.000210	-0.416857	0.6802
INT(-1)	-0.000195	0.000242	-0.804454	0.4284
INT(-2)	0.000273	0.000236	1.155060	0.2586
INF	-3.34E-05	5.55E-05	-0.601860	0.5525
INF(-1)	-6.00E-06	4.55E-05	-0.131933	0.8961
R-squared	0.307929	Mean dependent var	0.001586	
Adjusted R-squared	-0.038106	S.D. dependent var	0.002719	
S.E. of regression	0.002770	Akaike info criterion	-8.670833	
Sum squared resid	0.000199	Schwarz criterion	-8.079725	
Log likelihood	187.4167	Hannan-Quinn criter.	-8.457107	
F-statistic	0.889878	Durbin-Watson stat	2.521829	
Prob(F-statistic)	0.573085			